

# Claims

- [c1] What is claimed is:
1. A plasma cutting system comprising:  
a plasma cutting power source;  
a plasma torch operationally connected to the plasma cutting power source; and  
a serialization circuit disposed within the plasma torch to control transmission of multiple feedback signals from the plasma torch to the plasma cutting power source.
  - [c2] 2. The plasma cutting system of claim 1 further comprising a plurality of sensors configured to provide feedback signals to the plasma cutting power source.
  - [c3] 3. The plasma cutting system of claim 2 wherein the serialization circuit is configured to serialize feedback from the plurality of sensors to the plasma cutting power source.
  - [c4] 4. The plasma cutting system of claim 2 wherein the plurality of sensors includes at least two of a power source activation indicator, an electrode type indicator, a tip type indicator, a cup position indicator, a consumable indicator, a shorted component indicator, an air pressure

indicator, a temperature indicator, a trigger position indicator, a trigger safety indicator, an operation amperage indicator, a current transfer indicator, and a voltage drop indicator.

[c5] 5. The plasma cutting system of claim 1 further comprising a single communications link for transmission of multiple feedback signals to the plasma cutting power source.

[c6] 6. The plasma cutting system of claim 5 wherein the single communications link is configured to translate power from the plasma cutting power source to the plasma torch.

[c7] 7. The plasma cutting system of claim 1 further comprising an interrupt to transmit potentially problematic operating condition feedback to the power source by-passing the serialization circuit.

[c8] 8. The plasma cutting system of claim 7 wherein the potentially problematic operating condition feedback includes one of an over-temperature signal, a trigger release signal, and a consumable condition signal.

[c9] 9. The plasma cutting system of claim 1 wherein the serialization circuit includes at least one of an analog serializing circuit and a digital serializing circuit.

- [c10] 10. The plasma cutting system of claim 1 wherein the plasma torch is configured to operate with a maximum open circuit output voltage of greater than 220 volts DC.
- [c11] 11. A method of providing feedback from a plasma torch to a remote power source, the method comprising:  
receiving feedback from a plurality of sensors disposed in a plasma torch;  
arranging the feedback in a queue; and  
sending the feedback to a remote power source in an order the feedback is arranged in the queue.
- [c12] 12. The method of claim 11 further comprising interrupting the queue when the feedback received is a safety condition feedback signal.
- [c13] 13. The method of claim 11 further comprising transmitting the feedback to the remote power source via a single communications link.
- [c14] 14. The method of claim 13 further comprising transmitting power to the plasma torch across the single communications link.
- [c15] 15. A plasma torch assembly comprising:  
a torch body enclosing a plasma-cutting electrode;  
a plurality of sensors disposed within the torch body and

configured to provide feedback regarding at least operational conditions of a plasma cutting process; and  
a serializer disposed within the torch body to receive feedback from the plurality of sensors and configured to transmit the feedback to a remote processing unit via a single communications link.

[c16] 16. The plasma torch assembly of claim 15 wherein the plurality of sensors includes at least two of a power source activation indicator, a cup position indicator, a consumable indicator, a shorted component indicator, an air pressure indicator, a temperature indicator, a trigger position indicator, an operation amperage indicator, a current transfer indicator, and a voltage drop indicator.

[c17] 17. The plasma torch assembly of claim 15 wherein the serializer includes a serialization circuit configured to send the feedback as discrete feedback signals to the remote processing unit.

[c18] 18. The plasma torch assembly of claim 15 wherein the single communications link is a power-supply cable.

[c19] 19. A method of manufacturing a plasma cutting torch comprising:  
constructing a housing;  
enclosing a plasma-cutting electrode within the housing;

disposing a plurality of sensors within the housing to provide operational feedback regarding operational conditions of a plasma-cutting process;  
connecting the plurality of sensors to a serializing circuit such that feedback from the sensors is queued by the serializing circuit before being sent to a plasma-cutting power source.

[c20] 20. The method of claim 19 further comprising disposing the serializing circuit within the housing.

[c21] 21. The method of claim 19 further comprising disposing an interrupt of the serializing circuit within the housing to bypass the serialization circuit and transmit feedback indicating a potentially problematic operating condition to the plasma-cutting power source.

[c22] 22. The method of claim 19 further comprising manufacturing the housing, plasma-cutting electrode, plurality of sensors, and serializing circuit to operate with a maximum open circuit output voltage of greater than 220 volts DC.